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TRANSLATOR'S AFFIDAVIT

I, Andrew Wilford, a citizen of the United States of America, residing in Dobbs Ferry, New York, depose and state that:

I am familiar with the English and German languages;

I have read a copy of the German-language document PCT application PCT/DE2005/000538 published 20 October 2005 as WO 2005/098173; and

The hereto-attached English-language text is an accurate translation of this German-language document.

Andrew Wilford

Sworn to and subscribed before me
19 September 2006

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SYSTEM FOR PROTECTING BUILDINGS OR STRUCTURES

The invention relates to a system for protecting buildings or structures against external influences with wire cables that are placed under tension over and/or around at least a part of the building or structure.

Such a system is described in DE 10155174 A1. In order to provide the necessary protection to certain buildings (or structures) against external influences, e.g. protection of chemical plants containing highly toxic or highly explosive materials, nuclear-power facilities, or important public buildings, it is proposed that wire cables be stretched around the buildings (or structures), under tension, with thicknesses of at least 5 mm. One objective of this arrangement is to protect buildings (or structures) against intentional crashes of aircraft into them.

It is known that in the case of a crash (intentional or accidental) of an aircraft, wire cables have a cutting action on the parts of the aircraft, so the cables absorb an appreciable part of the kinetic energy of the impacting aircraft, and bring about early damage to or destruction of the aircraft. When the aircraft strikes the wire cables, any unavoidable explosions will occur earlier than otherwise (substantially earlier, if the distance of the wire cables from the building is sufficiently great), so that the blast effect of the explosion against the building can be appreciably limited. The wire cables under tension cannot prevent parts of the aircraft from affecting the building or structure, but the resulting damage is much less than from a direct impact where

the aircraft actually penetrates into the building or structure and releases kerosene that gives rise to raging fires. The particular shape of the cables, particularly their spacing, their distance from the building, and their diameter and thickness, can be adjusted to the given desired protective conditions, and to the degree of modifications to the buildings that can be accomplished at reasonable expense.

A precondition for the cutting action of the wire cables and the attendant protective effect of the system is that the wire cables not break. Accordingly, it was proposed in the above-cited document that the wire cables be connected to elastic bodies, preferably helical springs, so as to increase the elasticity of the tensioning of the wire cables. However, in practice it is very difficult to provide elastic bodies that have directional constants that determine the restoration force, which constants are optimal and remain optimal with the passage of time. These problems are not only characteristic of the protective systems proposed in the above-cited publication but they are present in any situation in which one seeks to have secure and stable holding and tensioning of wire cables in a holding mechanism.

It is an object of the present invention to devise a system for protecting buildings or structures against external influences with wire cables that are placed under tension over and/or around at least a part of the building or structure, so that, in a simple manner, when the tensile force acting on the wire cable (active force) is increased, a resistance force (reaction

force) is generated in the wire cable holding mechanism, which resistance force is optimally adjusted to the active force.

To attain this object, a system is proposed having the combination of features according to claim 1, wherein according to the invention the wire cables are maintained under tension, and their ends or extensions thereof are anchored in a clamping body or the like that has a guide that is shaped such that when the tension is increased the reaction force presented by the clamping body is increased generally proportionally thereto.

Additional solutions are proposed that will be described individually hereinbelow. First, it is possible to make the (hollow tubular) guide for the end of the wire cable and/or of extensions of the wire cable conical so that, in the generally unstressed or only slightly stressed state, the outside surface of the wire cable rests against an inner surface of the guide or is spaced at a distance therefrom. When tension is applied to the wire cable, it is drawn into a conical shape and at first additional friction and later actual deformation occurs. This solution may be provided purely geometrically by the construction of the cable and the guide, in certain circumstances it may also be provided mechanically, to which end an active mechanism is employed, controlled with the aid of, e.g. a system for measuring travel, so that control is exerted by causing the inner surface of the guide to be narrowed and/or otherwise reduced in size. The situation is analogous for extensions connected to the wire cable ends, which extensions may have different shapes, e.g. a strip-like shape.

According to another embodiment of the invention, the material of the inner surface of the guide for the wire cable (or an extension of the cable) is selected to be harder than the material of the end of the wire cable and/or the material of the end of the extension, so that when a tensile force is exerted on the cable end (or extension end) that pulls the end into the guide having a narrowing shape, the end must undergo deformation to a smaller external diameter. Preferably the relevant diameters are adjusted such that the wire cable (or extension) is plastically deformed when it undergoes relative movement through the guide in the direction of the tensile force.

It is basically also possible for the wire cable ends to be divided into a plurality of partial cable elements that are maintained at a mutual spacing so that the conical end region of the wire cable is formed by these wire cable ends.

The guide means in the holding body be formed from a conical tube or passage whose periphery is closed, or from clamping jaws disposed at mutual angles, or from spring-loaded rolls.

The ends of the wire cables or wire-cable extensions can also have configurations that have a multiple stepwise broadening, so that, when a tensile force is applied to the wire cable, the wire cable undergoes stepwise yielding. If the diameter of the wire cable end broadens gradually (steplessly), then, depending on the materials and their degrees of deformation, the reaction force increases generally proportionally to the increase of diameter. According to a comparable inventive configuration, a die like a drawing die is provided, and a material of greater diameter is

drawn through the die and is reduced in diameter. Generally, the resistance presented by the forces active in the deformation ought to be the same for all of the cables that serve to protect a given building or structure. In special cases, however, it is possible that different reaction forces will be provided by different cables, to which end one might select a configuration wherein one or more cables will break sooner than other cables, namely under a lower stress. If control means are provided for controlling these differences in reaction force, under certain circumstances one can utilize this feature to alter the flight path of an impacting aircraft.

It is also possible, within the scope of the present invention, to connect a plurality of cables to a plate-like strip that is anchored in a holding system (e.g. clamping system) and that is shaped such that its width increases with distance from the end by which it is connected to the cables. The strip may be wound up, e.g. on a roll. When a tensile force is applied to the strip via the cable(s) connected to it, the strip can undergo a relative movement in the direction of the applied force only by deformation.

To increase the cutting effect, it has also been proposed to coat the surface of the wire cables, at least in partial regions, with a hot-pressed abrasive cutting material, or to provide the cables with hooks or teeth or similar ripping or cutting implements. Alternatively, the wire cables may be given an oval or blade-shaped cross section similar to a knife blade. Similarly to a knife edge, the cutting edge of the wire cable may be provided with a wavy or serrated edge, to optimize cutting

capability. The inventive concept also includes the possibility of applying a high voltage to the wire cable and/or applying explosive charges, to exert the maximum possible destructive influence upon an impacting aircraft. The greater the damage to the aircraft outside the building the less the chance that the aircraft and its dangerous kerosene will penetrate inside the building. The fuel is dangerous because it will ignite and spread fire within the building. For example, in the case of the World Trade Center towers, it was the effect of the fire and its attendant heat on the supporting structure that led to the collapse of the towers.

According to another embodiment of the invention, the wire cables can be contained within and/or on the facade or roof of the building, for protection.

Accommodating the wire cables in the facade and/or roof of the building that one seeks to protect, not only hides the cables from the sight of onlookers, but also provides a safe, secure, and reliable means of storing the wire cables during periods in which the building or structure does not need protection against external influences. Thus one avoids circumstances in which, intentionally or otherwise, the system itself, in which the wire cables are under constant tension, suffers damage from external influences.

Preferably, for protective storage purposes the wire cables are accommodated in profiles that are mounted in the facades and roof, e.g. when one is retrofitting an existing building or structure, the profiles may be applied outside on the facades and/or roof. These profiles form a cavity, individually or in

combination with the structure of the facade. To tension them, the wire cables are moved out of the cavity.

Profiles mounted in or on the facades and/or roof, for accommodating the wire cables, are included in the structure and design of the facades and/or roof, or are adapted to the existing such structures and designs, so that they are incorporated in the structures and designs of the facades and/or roof, and are not perceived as unattractive. Particularly with public buildings or structures, degradation of the appearance of the building or structure, which appearance has a representative function, is undesirable.

Further, the inventive system may be specifically and intentionally employed as a decorative element.

According to a particular embodiment of the protective system, the holding body in which the end of the wire cable or of the wire-cable extension is held is translationally moveably connected to the building or structure. Furthermore, T-shaped rails or the like may be recessed in the ground around the building or structure, on which rails the clamping bodies, and/or movable carriages for accommodating the clamping bodies, can be moved. The movement of a clamping body or carriage along the rails, in a direction away from the building or structure, while the upper ends of the wire cables are attached to the upper regions of the facade or to the roof or a central mast mounted on the roof, results in the wire cables being moved out of their normal seated position and placed under tension. In the event that a wire cable breaks, a plurality of other wire cables are present positioned side by side

in the cavity, which cables can be successively placed under tension, so that the tensioning process can be repeated and the system can be restored to functionality. In this connection, the carriage can be equipped with a grab similar to that on an aircraft carrier, so that if a given cable placed under tension breaks, the carriage can be returned and can engage the next cable, pull the next cable out, and place it under tension.

According to a preferred embodiment of the invention, the wire cables are connected to profiles that are mounted on the region of the facades and/or roof and that are rotatable and/or swingable and/or translationally movable, so that by a suitable movement of the profiles the wire cables are drawn out of their protective storage locations and are placed under tension. According to this embodiment, one may omit positioning a wire cable and/or profile near the ground, in order to maintain the usability of the access areas and traffic areas around the building. This also avoids possible injury to persons from tensioned wire cables near the ground.

According to a embodiment of the invention, a frame structure is provided that is positioned outside the original facade, to serve as an additional facade. The frame structure may be mounted on rails so as to be rotatable and/or translationally movable, so that the position of the frame structure with respect to the building or structure may be changed, e.g. to increase the distance between the frame structure and the building, or to move the frame structure around the building. The wire cables are accommodated inside the frame structure, and when needed they may

be withdrawn from the frame structure and tensioned like curtains. The wire cables may be oriented horizontally and/or vertically and/or diagonally, e.g. at a particular angle); one can construct net-like structures.

A frame structure disposed outside the facade may exercise additional functions, e.g. it may accommodate concealing elements or shade-providing elements; and/or spotlights for casting light on the building or structure at night. The frame structure may be employed as an architectonic element, and ought to be included in the design of a new building or structure with which it is to be used. Even an existing building can be architecturally enhanced by adding an appropriate frame structure.

Advantageously, the described system has central control means that are connected to a warning system. When a warning of a hazard is issued, the system is actuated, manually or automatically, and the wire cables are withdrawn from their seats and placed under tension. If the wire cables are attached to profiles, during the ensuing rotational and/or swinging and/or translational movement of the profiles an alarm is triggered, so that individuals who are present, particularly individuals who might be in the path of movement of the system, will be given notice and can move out of the way in timely fashion.

Embodiments of the inventive system are illustrated in the accompanying drawings. Therein:

FIG. 1 is a schematic illustration of a wire cable end that is held in the guide of a clamping body;

FIG. 2 is a schematic illustration of a building with outwardly moveable, and swingable, profiles in the roof region;

FIG. 3 is a schematic illustration of a building with swingable profiles in the roof region;

FIG. 4 is a schematic illustration of a building with fan-like out-swinging profiles in the roof region;

FIG. 5 is a schematic illustration of a building with translationally displaceable swing-out profiles in the facade region;

FIG. 6 is a frame structure that is mounted outside the facade and that is rotatable and/or translationally displaceable;

FIG. 7 is a frame structure disposed outside the facade.

The clamping body 10 illustrated in FIG. 1 has a guide 11 with a conical interior surface. The wire cable has a small-diameter region 12, a middle region 13 with a conical transition, and a cylindrical end region 14. If the wire cable is moved in the direction of arrow 15 by means of existing tensile forces, the conical outer surface 16 of the middle region 13 is forced against the conical inner surface 11 of the guide, as a result of which it is only possible to further move the wire cable in the direction of arrow 15 if the wire cable is plastically deformed to a smaller diameter. The inventive wire cable clamping means provides a relatively strong and secure, unyielding clamping that has sufficient give when the tensile force is substantially increased that one avoids breakage of the wire cable as would occur if a fully rigid clamping means were employed. On the other hand, the clamping means is not so yielding as would be the case with a

spring-loaded clamping means or clamping means that exhibit compliance over time when in use. In particular, the proposed wire cable clamping means has the advantage that undesirable vibrations and oscillations such as can occur with spring means are essentially avoided.

In alternative embodiments, the transitions of the outer surface 16 may be realized in a stepwise manner. The clamping system 10 may be comprised of jaws that may have fixed spacings or spacings that are adjustable. The wire cable end may be connected to an extension that may have a strip shape, which extension may have regions that are deformable via a clamping system 10.

The building 21 illustrated schematically in FIG. 2 has vertically extending profiles 22 that provide protective storage means for the wire cables. The functioning of the inventive system may be illustrated using the example of a given wire cable 23 under tension. In order to exert tension on the wire cable 23, a profile 24 disposed in the region of the roof to which the upper end of the wire cable 23 is fixed is moved outward in the direction of arrow a and is swung upward in the direction of arrow b. The movement of the profile 24 pulls the wire cable 23 off the receiving means, and places the wire under tension. The lower end of the wire cable 23 is held in the receiving means in a manner such that it is translationally movable, and it is moved in the direction of arrow c.

FIG. 3 illustrates a variant of the system illustrated in FIG. 2. Instead of the extensible profile, pivotable profiles 25 are supported against a central mast 26, and form a generally

conical roof. The generally conical shape is governed by the basic shape of the building, which need not be a circle. In order to place the wire cable 23 under tension, the profile 25 is pivoted outward from the tip of the mast in the direction of arrow d. The wire cable 23 that is connected to the free end of the profile 25 is carried along. This causes the foot point of the wire cable 23 to be translationally moved in the direction of arrow c, as in the embodiment according to FIG. 2. The upper end of the wire cable 23 is connected to the top of the mast 26. In order to provide additional length to the wire cable, the upper end of the wire cable 23 can also be accommodated in the mast, and to exert tension on the wire cable it can be withdrawn.

FIG. 4 illustrates an inventive system comprised of interfitting profiles 27 disposed in the plane of the roof, which profiles 27 are swingable upward in a fan-like manner in the direction of arrow e. With this swinging movement, the wire cable 23 is carried along, and is drawn outward from its protective storage location flush with the surface of the roof.

In the configuration according to FIG. 5, the wire cables are accommodated in the plane of the facade. The facade carries profiles 28 are disposed that are translationally moveable in the direction of arrow f and simultaneously are swingable in the direction of arrow g.

The wire cables 23 are attached to the free ends of pivotal legs of the profile 28, so that they are entrained and are placed under tension. In FIG. 6, the translational movements of

the profiles 28 are illustrated on the left side, and the swinging movements of the profiles 28 are illustrated on the right side.

Alternatively to the above-described configurations, FIGS. 6 and 7 illustrate a frame structure 29, 29' disposed outside the facade whose position is changeable with respect to the building.

FIG. 6 illustrates a frame structure 29 that is disposed at a distance from the building 21. The wire cables 23 are accommodated in a lateral part of the frame structure 29. The ends of the wire cables, here the lower and upper ends, are translationally movably held in the frame structure 29, so that the wire cables can be pulled out of their protective storage locations, in the direction of arrow i, like a curtain. The frame structure 29 can be moved along rails 20 installed in the ground and can be moved in a circle around the building 21 (see arrow h). The frame structure 29 can be positioned like a protective shield, e.g. to protect a particular region of the building.

In FIG. 7 the basic shape of the building is rectangular. The building can however have essentially any shape. The frame structure 29' is movable outward from the building 21 in the direction of arrow j, along rails 20 installed in the ground. This movement results in increasing of the distance between the frame structure 29' and the building 21. Analogously to the configuration according to FIG. 6, the wire cables 23 are accommodated in a side part of the frame structure 29', and can be pulled out when necessary.

The inventive system is not limited in applicability to a particular basic shape of a building or structure, nor to a particular construction of the facade or roof. Therefore, the system can be adapted for use with existing buildings or structures. Further, combinations of the disclosed configurations and embodiments may be employed so that e.g. for a particularly tall building one can conceive of using a combination of the configurations according to FIGS. 4 and 5. The roof and the upper region of the facade are protected with the system according to FIG. 4, and the regions therebelow are protected with the system according to FIG. 5.